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EXHIBIT 7

Lucent Technologies
Bell Labs Innovations



MAX TNT® True Access™ Operating System (TAOS) 8.0-103 (MultiVoice)

Addendum

Part Number: 7820-0683-001
For software version 8.0-103
April 2000

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Notices and known issues
Notice about MAX TNT TAOS 8.0.1 and 8.0-103

Notices and known issues

Notice about MAX TNT TAOS 8.0.1 and 8.0-103

The core and extended features available in MAX TNT TAOS 8.0.1 are incorporated in TAOS 8.0-103. Details about using TAOS features, other than MultiVoice, may be found in the MAX TNT True Access™ Operating System (TAOS) 8.0.1 Addendum.

Notice of modified RADIUS port and ID space defaults

Note: This modification could cause authentication failures with RADIUS servers that do not support distinct UDP source ports. If your RADIUS server does not support authentication requests from multiple source ports, you must reset the modified parameters to their previous values.

The default settings for User Datagram Protocol (UDP) source ports and ID spaces for communication with a RADIUS server have been changed from single to multiple. Following are the relevant parameters, shown with the new default settings:

```
[EXTERNAL-AUTH]
rad-id-space = distinct
rad-id-source-unique = port-unique
```

MAX TNT units can use either a single global source UDP port for all slot cards, or a unique port for each card. Similarly, a unit can use one ID space for both authentication and accounting requests, or a distinct space for each type of request.

Previous TAOS versions recommended the use of multiple source ports and ID spaces for performance reasons, and because use of a single source port and ID space reduces the number of simultaneous requests that the unit can generate. However, the default settings configured a single global source port and ID space to ensure compatibility with all RADIUS servers.

In this release, the default settings have been changed to the recommended values.

If the system was already using the recommended settings, this change will have no effect.

Systems that used the previous default settings will respond as follows:

- If the RADIUS server supports distinct source ports, the system will experience a slight improvement in performance.
- If the RADIUS server does not support distinct source ports, the system will experience problems with RADIUS authentication and accounting.

To communicate with RADIUS servers that do not support distinct source ports, you must modify the External-Auth profile as follows to restore the parameters to their previous values:

```
admin> read external-auth
EXTERNAL-AUTH read
admin> set rad-id-space = unified
admin> set rad-id-source-unique = system-unique
```

Notices and known issues***Notice of modified behavior during IPDC negotiation***

```
admin> write
EXTERNAL-AUTH written
```

Notice of modified behavior during IPDC negotiation

In previous releases, the MAX TNT unit's system address was used during IP Device Control (IPDC) protocol negotiation. In previous releases, if the System-IP-Addr parameter was null, the shelf controller IP address was used.

Since MAX TNT TAOS 8.0.1, the MAX TNT unit requires a valid System-IP-Addr setting to complete IPDC negotiation. For example, the following commands explicitly set the system address to the shelf controller IP address:

```
admin> get ip-int { {1 c 1} 0} ip-address
ip-address = 10.2.3.4

admin> read ip-global
IP-GLOBAL read

admin> set system-ip-addr = 10.2.3.4

admin> write
IP-GLOBAL written
```

Note: If the System-IP-Addr setting is null, the system terminates PPP connections during the IPCP negotiation phase.

Notice of discontinuance of software support

Software support has been discontinued for the MAX TNT Ethernet-0 slot card (TNT-SL-E10), the Fast (100 MB) Ethernet-1 slot card (TNT-SL-E100), and the older MAX TNT Hybrid Access slot cards (TNT-SL-HA128 and TNT-SL-HA192).

Notice about upgrading slot cards

If you replace a MAX TNT Fast (100 MB) Ethernet-1 slot card (TNT-SL-E100) with a newer Ethernet card (TNT-SL-E10-100 or TNT-SL-E100-V-C), you must write new Ethernet profiles for the new card. The old Ethernet profiles do not carry forward.

If you replace an older MAX TNT Hybrid Access slot card (TNT-SL-HA128 or TNT-SL-HA192) with a newer Hybrid Access card (TNT-SL-HDLC2 or TNT-SL-HDLC2-EC-C), and if you replace a MAX TNT Series56 modem card (TNT-SL-48MOD-S56) with a newer Series56 card (TNT-SL-48MOD-S-C or TNT-SL-48MODV3-S-C), you must write new profiles for the new cards.

If you replace a Series56 modem card (TNT-SL-48MOD-S56, TNT-SL-48MOD-SGL, TNT-SL-48MOD-S-C or TNT-SL-48MODV3-S-C) with a MultiDSP card (TNT-SL-ADI-C, TNTV-SL-ADI-C, or APX8-SL-96DSP), you must write new profiles for the new cards.

For any slot whose card type is being changed, you should perform a `slot -r` command after downing (`slot -d`) or removing the existing card prior to inserting a new card type.

Notices and known issues
Known issues in this release

Known issues in this release

- LAN-Modem profiles contain entries for 96 devices. For the 96-port MultiDSP card, all 96 entries in the profile are used. For 48-port modem cards (Series56 modem card (TNT-SL-48MOD-S56), Series56 II (TNT-SL-48MOD-S-C), and Series56 III (TNT-SL-48MODV3-S-C) cards), only the first 48 entries are used. For the 48-port MultiDSP card (TNT-SL-ADI-C or TNTV-SL-ADI-C), every other entry in a LAN-Modem profile is used (odd ports only, from 1 to 95).
- Incompatibility with MultiVoice Access Manager Release 2.x.
 - Dynamic call control and multiple logical gateways are only supported in MultiVoice networks running TAOS Release 8.0-103 on the gateways and MVAM Release 3.0 on the gatekeepers. These features are not supported in MultiVoice networks where gatekeepers are running Release 2.x of the MultiVoice Access Manager.
 - New parameter definitions are added to the Non-Standard data messages (such as, trunk/DS0 reporting, non-standard call failure codes) sent by a MultiVoice Gateway to the MultiVoice Access Manager.
- Change in Call-logging packet format

In releases prior to 7.2.0, the format of Call-logging packets are identical to RADIUS Accounting packets. With the introduction of 7.2.0, Call-logging will no longer be compatible with RADIUS, although Lucent's NavisAccess product fully supports MultiVoice Call-logging. The MAX TNT continues to support RADIUS accounting, SNMP and SYSLOG functionality.

Because of the proprietary nature of and potential modification to call-logging packets, you should not use call-logging packets with any application other than Lucent's NavisAccess.

Upgrade and downgrade procedures
Requirements and recommendations

Upgrade and downgrade procedures

This section shows how to upgrade and downgrade the TAOS software of a MAX TNT unit.

Note: Digital subscriber loop (DSL) functionality is not supported in this release. See "Notice of discontinuance of MAX TNT support for DSL" on page 14.

Requirements and recommendations

These recommendations for upgrading MAX TNT units help ensure a smooth upgrade. If you must downgrade from this release to a previous one, please see "Downgrade instructions" on page 6.

Obtaining the MAX TNT TAOS 8.0-103 software

The MAX TNT TAOS 8.0-103 software consists of the following files:

Filename	Descriptions
tntsr.b.in	The boot loader. Both T1 and E1 loads use the same boot loader software. Lucent recommends that you always install a new boot loader when upgrading to a release.
tntrel.tar	Tar file (T1 load) that contains images for the shelf controller and all MAX TNT slot cards.
tntrele.tar	Tar file (E1 load) that contains images for the shelf controller and all MAX TNT slot cards.

You can obtain the files you need from the anonymous FTP server <ftp.ascend.com>. If you need technical assistance, see "Customer Service" on page 3.

Local access to the unit recommended

Whenever you install system software, Lucent recommends that you access the unit through the shelf controller serial or LAN port rather than a slot card port.

32-MB JEDEC DRAM card required for this release

For this release, the MAX TNT requires a 32-MB JEDEC DRAM card (model number TNT-SP-DRAM-32). New MAX TNT units now ship standard with the 32-MB DRAM card.

The 32-MB JEDEC DRAM card is *not* hot swappable. To install the card, you must turn off power to the MAX TNT, insert the card and then power on the MAX TNT. For additional information about the card, contact your service representative.

Flash size limitations for this upgrade

Because the MAX TNT supports many different slot card types, the tar files containing slot-card code images can be too large to load on an 8-MB flash card. TAOS 7.0.0 introduced a new

Upgrade and downgrade procedures

Requirements and recommendations

Load-Select profile type that prevents loading the entire set of slot-card images. The profile causes the system to determine which card types are present and load only those images. For details about the Load-Select profile, see the *MAX TNT Reference Guide*.

In addition, in this release, the `tntbase.tar` and `tntbasee.tar` files are less than 8-MB in size and are guaranteed to fit on an 8-MB flash card.

If neither of the small tar files are appropriate for your systems, to load this release to 8MB flash, make sure that all parameters in the Load-Select profile are set to `auto` and that the combined binaries required to run the system and its cards do not exceed 8MB. Following are the approximate sizes of each binary in the tar file:

Table 1. Approximate sizes of shelf controller and card binaries

System component	Binary filename	Approx. size (KB)
Shelf controller (T1)	<code>tntsr/tntsr.ffs</code>	1800
Shelf controller (E1)	<code>tntsre/tntsre.ffs</code>	1800
8T1	<code>tnt8t1/tnt8t1.ffs</code>	275
UTI (Frameline)	<code>tntut1/tntut1.ffs</code>	825
8E1	<code>tnt8e1/tnt8e1.ffs</code>	260
UE1 (E1 Frameline)	<code>tntue1/tntue1.ffs</code>	810
T3	<code>tntt3/tntt3.ffs</code>	310
Ethernet-2	<code>tntenet2/tntenet2.ffs</code>	240
Ethernet-3	<code>tntenet3/tntenet3.ffs</code>	355
HDLc-2	<code>tnthdlc2/tnthdlc2.ffs</code>	1005
HDLc-2EC	<code>tnthdlc2ec/tnthdlc2ec.ffs</code>	1000
SWAN	<code>tntswan/tntswan.ffs</code>	725
UDS3	<code>tntuds3/tntuds3.ffs</code>	730
DS3-ATM	<code>tntds3atm/tntds3atm.ffs</code>	735
OC3-ATM	<code>tntoc3atm/tntoc3atm.ffs</code>	730
Analog modem	<code>tntamdm/tntamdm.ffs</code>	700
56K modem	<code>tntmdm56k/tntmdm56k.ffs</code>	850
Series56 I/ Series56 II	<code>tntcsmx/tntcsmx.ffs</code>	990
Series56 III	<code>tntcs3v/tntcs3v.ffs</code>	980
MultiDSP	<code>tntmadd/tntmadd.ffs</code>	1300
STM-0	<code>tntstm0/tntstm0.ffs</code>	300

Saving the system configuration

As a general practice, always save the system configuration before upgrading or downgrading system software. You can then restore the configuration along with earlier system software if anything unexpected occurs during the upgrade or downgrade. If you use TFTP to save the system configuration, the target file must exist on the TFTP server and you must have permission to write it. For example, the following commands executed on a TFTP server create a target file and set its permissions:

```
$ touch /tftpboot/config/testcfg.1
```

Upgrade and downgrade procedures

Upgrade instructions

```
$ chmod a=rw /tftpboot/config/testcfg.1
```

Before you save the system configuration, you must enable the Allow-Password permission in the MAX TNT User profile to save the configured passwords. If you do not have Allow-Password permission enabled, you will be prompted to confirm that you wish to save the configuration without passwords. If you do so and then restore the saved configuration, all passwords in the configuration are wiped out. The following commands executed on the MAX TNT save the system's configuration to the target file on the TFTP server and then restore the saved configuration:

```
admin> save -a network 10.10.10.10 /tftpboot/config/testcfg.1
admin> load config network 10.10.10.10 /tftpboot/config/testcfg.1
```

Upgrade instructions

These instructions show how to upgrade to MAX TNT TAOS 8.0-103 from TAOS version 7.0.0 or later. If you are not sure which version the system is running, enter the version command. For example:

```
admin> version
Software version 7.2.0
```

If the system is running a software version earlier than 7.0.0, please upgrade to 7.0.0 first and then follow the instructions in this note. For information about upgrading to 7.0.0, you can access the MAX TNT TAOS 7.0.0 release note at <http://www.ascend.com/doclibrary>.

Note: Under certain conditions, the `load tar` command might recognize no slot cards and load only the shelf controller image during the upgrade procedure. If this occurs, reset the system and load the tar file again. The second `load tar` command will load the appropriate slot-card images for the system.

If you are upgrading from MAX TNT TAOS 7.0V

MAX TNT TAOS 8.0-103 introduces a DOS-compatible general-purpose file system. If you are upgrading to MAX TNT TAOS 8.0-103 from a TAOS 7.0V release and you intend to use the new file system format, you must first reformat the flash card to the old format. This is required. For example:

```
admin> format -o flash-card-1
```

After formatting the flash card to the old format, follow the upgrade instructions in the next section or in "Upgrading a multishelf MAX TNT unit" on page 4.

The initial format operation erases the card's contents, including all voice announcements stored on the card. When the upgrade is complete, you must reload the voice announcements. For example, the following command loads a voice-announcement file named `busy.au` from a TFTP server at 10.10.10.10 to the `/current` directory on flash card 1 (flash card 1 is the default):

```
admin> load file network 10.10.10.10 busy.au
```

For more information details about loading voice announcements, see "Storing voice announcements in the FAT-16 flash memory file system" on page 268.

Upgrade and downgrade procedures

Upgrade instructions

Upgrading a standalone MAX TNT unit

To upgrade a standalone unit with 8MB flash, proceed as follows:

- 1 Log into the system and save its configuration to a TFTP server. This step is optional but strongly recommended. For details, see "Saving the system configuration" on page 2.
- 2 Verify that the combined binaries required to run the system and its cards do not exceed 8MB. See "Approximate sizes of shelf controller and card binaries" on page 2.
- 3 Verify that the Load-Select profile is configured to automatically load only required binaries. All parameters in the profile must be set to auto.
- 4 Format the flash card. For example:

```
admin> format flash-card-1
```
- 5 Load the boot loader. For example:

```
admin> load boot-sr network 10.10.10.10 tntsr.b
```
- 6 Load the tar file. For example:

```
admin> load tar network 10.10.10.10 tntrel.tar
```
- 7 Reset the system. This step is required. For example:

```
admin> reset
```
- 8 Telnet into the system via the serial connection. Verify that the shelf controller IP address is set. For example:

```
admin> get ip-interface { { 1 c 1 } 0 } ip-address
[ in IP-INTERFACE/{ { shelf-1 controller 1 } 0 } :ip-address ]
ip-address = 10.10.10.2/24
```

If the address is not set, open the IP-Interface profile for the shelf controller and set the address. For example:

```
admin> read ip-interface { { 1 c 1 } 0 }
IP-INTERFACE/{ { shelf-1 controller 1 } 0 } read
admin> set ip-address = 10.10.10.2/24
admin> write
IP-INTERFACE/{ { shelf-1 controller 1 } 0 } written
```
- 9 Load the system configuration. This step is optional, but recommended. For example:

```
admin> load config network 10.10.10.10 /tftpboot/config/tntconfig
```
- 10 Format the flash card again. For example:

```
admin> format flash-card-1
```
- 11 Load the tar file again. For example:

```
admin> load tar network 10.10.10.10 tntrel.tar
```
- 12 Reset the system. This step is optional, but recommended. For example:

```
admin> reset
```

Upgrading a multishelf MAX TNT unit

If you are upgrading a multishelf system, you must propagate the new boot loader to the slave shelves by using the Loadslave command. (The version of the tntsr.b.bin file on the master shelf must match the tntsr.b.bin version on the slave shelves. Otherwise, the slave shelves cannot load code from the master shelf.) In addition, you must propagate a link to a redundant image of the tar file located in onboard flash.

Upgrade and downgrade procedures
Upgrade instructions

To upgrade a multishelf unit with 8MB flash, proceed as follows:

- 1 Log into the master shelf and save the configuration to a TFTP server. This step is optional but strongly recommended. For details, see "Saving the system configuration" on page 2.
- 2 Verify that the combined binaries required to run the system and its cards do not exceed 8MB. See "Approximate sizes of shelf controller and card binaries" on page 2.
- 3 Verify that the Load-Select profile is configured to automatically load only required binaries. All parameters in the profile must be set to auto.
- 4 Format the flash card. For example:

```
admin> format flash-card-1
```
- 5 Load the boot loader. For example:

```
admin> load boot-sr network 10.10.10.10 tntsr.b
```
- 6 Propagate the new boot loader to the slave shelves. For example, the following command propagates the boot loader to a slave shelf with a rotary-switch setting of 2:

```
admin> loadslave 2 boot-sr
```
- 7 Load the tar file. For example:

```
admin> load tar network 10.10.10.10 tntrel.tar
```
- 8 Reset the system. This step is required. For example:

```
admin> reset -a
```
- 9 Telnet into the system via the serial connection. Verify that the master shelf controller IP address is set. For example:

```
admin> get ip-interface { { 1 c 1 } 0 } ip-address
[ in IP-INTERFACE/{ { shelf-1 controller 1 } 0 } :ip-address ]
ip-address = 10.10.10.2/24
```

If the address is not set, open the IP-Interface profile for the shelf controller and set the address. For example:

```
admin> read ip-interface { { 1 c 1 } 0 }
IP-INTERFACE/{ { shelf-1 controller 1 } 0 } read
admin> set ip-address = 10.10.10.2/24
admin> write
IP-INTERFACE/{ { shelf-1 controller 1 } 0 } written
```
- 10 Load the system configuration. This step is optional, but recommended. For example:

```
admin> load config network 10.10.10.10 /tftpboot/config/tntconfig
```
- 11 Format the flash card again. For example:

```
admin> format flash-card-1
```
- 12 Load the tar file again. For example:

```
admin> load tar network 10.10.10.10 tntrel.tar
```
- 13 Use the Loadslave command to propagate a link to the image2 file, which is a redundant image of the tar file created in onboard flash. For example, the following command propagates the image to a slave shelf with a rotary-switch setting of 2:

```
admin> loadslave 2 image2
```
- 14 Reset the system. This step is optional, but recommended. For example:

```
admin> reset -a
```

Upgrade and downgrade procedures
Downgrade instructions

Downgrade instructions

Because releases are not necessarily backward compatible, Lucent recommends that you always restore a backup configuration made under the previous version or one of its predecessors.

If you have enabled extended profiling and then must downgrade to an earlier software version, see "Additional onboard memory for extended profiling" on page 92, for important information.

Note: Serial access to the MAX TNT unit is required for downgrading to a previous release from MAX TNT TAOS 8.0-103. Because of the new profiles and functionality introduced in MAX TNT TAOS 8.0-103, you must initialize the system by clearing the onboard nonvolatile random access memory (NVRAM) when performing a downgrade. When you clear NVRAM, the initialized system starts up unconfigured, just as it was when you first installed it, with no IP address assignments.

Downgrading a standalone MAX TNT unit

To restore an earlier system software version, proceed as follows:

- 1 Log into the MAX TNT and save the current configuration to a TFTP server. This step is optional, but recommended.
- 2 Reformat the flash card to the old format. This is required. For example:

```
admin> format -o flash-card-1
```
- 3 Load the previous version of the boot loader. For example:

```
admin> load boot-sr network 10.10.10.10 tntarb.bin
```
- 4 Load the previous version of the tar file. For example, to load via TFTP from a local host:

```
admin> load tar network 10.10.10.10 tntrel.tar
```
- 5 Clear NVRAM. This step is required when downgrading. For example:

```
admin> nvram -f
```
- 6 Telnet into the system via the serial connection. Open the IP-Interface profile for the shelf controller and set the address. For example:

```
admin> read ip-interface { { 1 c 1 } 0 }
IP-INTERFACE/{ { shelf-1 controller 1 } 0 } read
admin> set ip-address = 10.10.10.2/24
admin> write
IP-INTERFACE/{ { shelf-1 controller 1 } 0 } written
```
- 7 Load a backup configuration made under the restored software version or one of its predecessors. For example:

```
admin> load config network 10.10.10.10 /tftpboot/config/7x-config
```
- 8 Reset the system. This step is optional, but recommended. For example:

```
admin> reset
```

Upgrade and downgrade procedures
Downgrade instructions

Downgrading a multishelf MAX TNT unit

If you are downgrading a multishelf system, you must propagate the restored boot loader to the slave shelves by using the Loadslave command. (The version of the `tntsr.b` file on the master shelf must match the `tntsr.b` version on the slave shelves. Otherwise, the slave shelves cannot load code from the master shelf.) In addition, you must propagate a link to a redundant image of the restored tar file. To restore an earlier system software version, proceed as follows:

- 1 Log into the master shelf and save the current configuration to a TFTP server. This step is optional, but recommended.
- 2 Reformat the flash card to the old format. This is required. For example:

```
admin> format -o flash-card-1
```
- 3 Load the previous version of the boot loader. For example:

```
admin> load boot-sr network 10.10.10.10 tntsr.b
```
- 4 Propagate the boot loader to the slave shelves. For example, the following command propagates the boot loader to a slave shelf with a rotary-switch setting of 2:

```
admin> loadslave 2 boot-sr
```
- 5 Load the previous version of the tar file. For example, to load via TFTP from a local host:

```
admin> load tar network 10.10.10.10 tntrel.tar
```
- 6 Clear NVRAM. This step is required when downgrading. For example:

```
admin> nvram -f
```
- 7 Telnet into the system via the serial connection. Open the IP-Interface profile for the shelf controller and set the address. For example:

```
admin> read ip-interface { { 1 c 1 } 0 }
IP-INTERFACE/{ { shelf-1 controller 1 } 0 } read
admin> set ip-address = 10.10.10.2/24
admin> write
IP-INTERFACE/{ { shelf-1 controller 1 } 0 } written
```
- 8 Load a backup configuration made under the restored software version or one of its predecessors. For example:

```
admin> load config network 10.10.10.10 /tftpboot/config/7x-config
```
- 9 Use the Loadslave command to propagate a link to the `image2` file, which is a redundant image of the tar file created in onboard flash. For example, the following command propagates the image to a slave shelf with a rotary-switch setting of 2:

```
admin> loadslave 2 image2
```
- 10 Reset the system. This step is optional, but recommended. For example:

```
admin> reset -a
```

MultiVoice features in MAX TNT TAOS 8.0-103
Modem manager

MultiVoice features in MAX TNT TAOS 8.0-103

Modem manager

Firmware versions for digital modems

The Conexant firmware versions for MAX TNT Digital Modem cards include support for V.90, K56flex, K56plus, and all slower, standard modem speeds. This release includes the following Conexant firmware:

- Series56 Digital Modem cards (also called CSM/1, TNT-SL-48MOD-S56) support V2.0982-K56_2M_DLP_CSM firmware.
- Series56 II Digital Modem cards (also called CSM/3, TNT-SL-48MOD-SGL and TNT-SL-48MOD-S-C) support V5.817 firmware.
- Series56 III Digital Modem cards (also called CSM/3V, TNT-SL-48MODV3-S-C) support V5.8173 firmware.

The V5.817 and V5.8173 firmware include a fix for synchronization rate failures with some PCtel chipset modems. The V5.8173 firmware also provides a fix for synchronization failures observed with some Lucent winmodems.

Firmware versions for MultiDSP cards

This release includes the following Lucent firmware versions for MultiDSP cards:

- 48-port MultiDSP cards (TNT-SL-ADI-C or TNTV-SL-ADI-C) support Lucent V0.1614.1 firmware.
- 96-port MultiDSP cards (APX8-SL-96DSP) support Lucent V0.1614.1 firmware.

Series56 III modem card support

The Series56 III Digital Modem card (TNT-SL-48MODV3-S-C) is a single-slot 48-port card that is the functional equivalent of the Series56 II card. Ongoing support continues in parallel for the Series56, Series56 II, and Series56 III modules.

The new Series56 III has the same installation and configuration procedures as the Series56 II card, described in the *MAX TNT Hardware Installation Guide*. The procedures are also described in the Series56 II guide, which you can access online after registering at <http://www.ascend.com/doclibrary>.

The output of the Show command identifies the Series56 III Digital Modem card as csmv-card, as shown in the following example:

```
admin> show
Shelf 1 ( standalone ):
  { shelf-1 slot-14 0 }      UP      csmv-card
```

MultiVoice features in MAX TNT TAOS 8.0-103

MultiVoice operations

Expanded MultiDSP card support

In addition to the 48-port MultiDSP card (TNTP-SL-ADI-C or TNTV-SL-ADI-C) a 96-port MultiDSP card (APX8-SL-96DSP) is now available.

Modem service is now supported and enabled by default on both MultiDSP cards.

With the appropriate software licenses, services currently supported on the 48-port MultiDSP card are: modem (for example, V.90), ISDN (HDLC), V.110, PHS, and VoIP (voice). The 96-port card does not support PHS or VoIP in this release.

PHS functionality now supports a fixed data rate of 32Kbps (PIAFS 1.0), or a fixed data rate of either 32Kbps or 64Kbps for the duration of a call (PIAFS 2.0), or a data rate that switches between 32Kbps and 64Kbps during a call, depending on what the wireless bandwidth permits (PIAFS 2.1). The PIAFS 2.1 functionality requires a separate license

The 48-port MultiDSP card supports 48 ports of any service and handles up to two different services per card. In this release, when running two services per card, the services can be used only in one of the following combinations:

- Data (modem/ISDN) with V.110
- Data (modem/ISDN) with PHS
- Data (modem/ISDN) with VoIP

The 96-port MultiDSP card currently supports 96 ports of data (modem/ISDN) and/or V.110 service, and handles up to two different services per card. When running two services per card, one service must be data and the other must be V.110. The 96-port card does not support PHS or VoIP in this release.

In this release, the following configuration restrictions apply:

- The 96-port and 48-port MultiDSP card cannot be used together in the same unit.
- The dual-port Series56 card (TNT-SL-48MOD-S56) cannot be used in the same unit with MultiDSP cards.

Multiple 48-port MultiDSP cards can be used in the same unit, and the Series56 II (TNT-SL-48MOD-SGL and TNT-SL-48MOD-S-C) and Series56 III (TNT-SL-48MODV3-S-C) cards can be used in the same unit as a MultiDSP card.

For further details on the MultiDSP cards, see the MultiDSP guide at <http://www.ascend.com/doclibrary>. After you register, you can view or download the guide.

MultiVoice operations

Support for MultiVoice operations was introduced with limited availability in earlier TAOS 7.x releases, and was made generally available in MAX TNT TAOS 8.0.2. This *Limited Availability Release* contains new features and corrections introduced in the True Access™ Operating System (TAOS) for the MAX TNT™, supporting the MultiVoice feature set.

MultiVoice functionality includes Voice over IP (VoIP) and a transparent data mode that enables users to run a modem on a VoIP channel. With a separate license on both ends of the transmission, MultiVoice also supports real-time fax over IP.

MultiVoice features in MAX TNT TAOS 8.0-103

MultiVoice operations

Note: This release note provides an overview of MultiVoice functionality and describes new MAX TNT TAOS 8.0-103 features that are not documented in the *MultiVoice for the MAX TNT Configuration Guide*. For details about MultiVoice configuration, see the guides at <http://www.ascend.com/doclibrary>.

In MAX TNT TAOS 8.0-103, the following MultiVoice software licenses can be enabled:

- VoIP, which enables the MAX TNT to act as an H.323v2 MultiVoice Gateway for transmission of real-time voice calls and transparent modem calls across IP networks.
- VoIP and SS7, which enables the MAX TNT to act as a MultiVoice Gateway that communicates with an SS7 signaling gateway to transmit real-time voice calls and transparent modem calls from an SS7 network across IP networks.
- Real-time fax (T.38) over IP, which uses the VoIP framework for call establishment, fax detection, and fax initiation.

For information about using MultiVoice for basic long-distance service and 800 service, and with overlapping coverage areas and multizone call routing, see the *MultiVoice for the MAX TNT Configuration Guide* at <http://www.ascend.com/doclibrary>.

System requirements for VoIP

To operate as a MultiVoice Gateway, a MAX TNT unit must have the following equipment and licenses:

- VoIP software licenses
- Sufficient MultiDSP cards to process VoIP calls
- Sufficient T1, T3, or E1 trunks to process VoIP calls
- Sufficient Ethernet-3 cards to process VoIP calls

If the MAX TNT unit will operate in an H.323 environment, it must also have an IP connection to a workstation running the MultiVoice Access Manager (MVAM) software.

If the unit will operate in an SS7 environment, the SS7 software license must also be enabled so that the system can perform IPDC packet processing.

Ethernet requirements for VoIP processing

MAX TNT units do not support routing of VoIP calls through the shelf controller Ethernet port. Ethernet-3 (TNT-SL-E100-V-C) cards are required for VoIP. The Ethernet-3 card is a high performance Ethernet module with one 100-MB interface designed for demanding applications such as VoIP.

Full-duplex mode required

When using the Ethernet-3 card to support VoIP call processing, the card must operate in full-duplex mode. The card operates in full-duplex mode by default, as specified in the setting of the following parameter:

```
[in ETHERNET/{ any-shelf any-slot 0 }]
duplex-mode = full-duplex
```

MultiVoice features in MAX TNT TAOS 8.0-103

MultiVoice operations

Compatible configuration in connecting port of hub or router

The 100-MB interface on the Ethernet-3 card is not autoconfigurable and Lucent does not recommend connecting it to a hub or router port that has been autoconfigured. Connecting it to an autoconfigured port can have negative effects on VoIP calls, including poor voice quality for connected calls and increased instances of initial call failures.

To ensure the best performance and quality for VoIP calls, make sure that the hub or router port that connects the Ethernet-3 card to the packet network complies with the following recommended configuration:

- Port autoconfiguration must be disabled.
- Port speed must be configured to operate at 100 Mbits only.
- Port must be configured for full-duplex transmission

Please refer to the manufacturer-provided documentation for your particular network hub, router or switch for specific instructions on configuring its Ethernet ports.

Note: It is not necessary to apply the recommended configuration to ports providing the outbound connection from the hub or router to the rest of the IP network. This configuration is required only for the port connecting to the Ethernet-3 card.

Overview of VoIP call routing

When a VoIP license has been enabled, the system creates a new Call-Route profile for each installed MultiDSP card that supports VoIP. The new Call-Route profile sets the Call-Route-Type parameter to `voip-call-type`, as shown in the following sample profile for a MultiDSP card in shelf 1, slot 3:

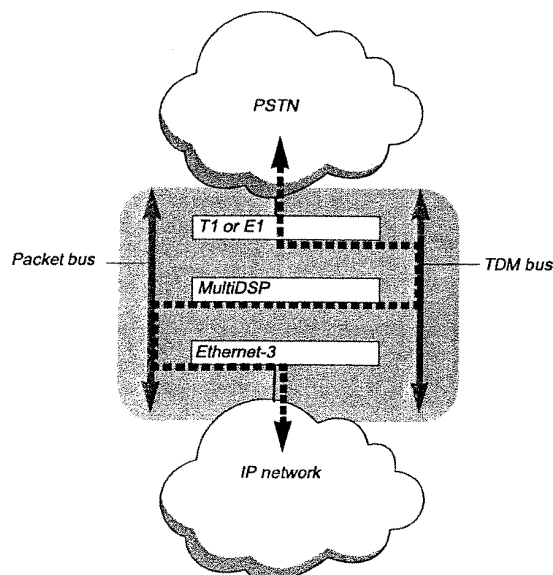
```
admin> get call-route { { { 1 3 0 } 0 } 3 }
[in CALL-ROUTE/{ { { shelf-1 slot-3 0 } 0 3 }}
index* = { { { shelf-1 slot-3 0 } 0 } 2 }
trunk-group = 0
phone-number = ""
preferred-source = { { any-shelf any-slot 0 } 0}
call-route-type = voip-call-type
```

The `voip-call-type` setting enables the system to route VoIP calls to the MultiDSP card. When the MAX TNT receives a VoIP call on a network line (such as T1 or E1), it routes the traffic internally on its time-division multiplex (TDM) bus to the MultiDSP card, which handles VoIP-related functions such as audio coder/decoder (codec) processing, RTP and UDP processing, and so forth.

The MultiDSP card then forwards the packetized traffic on the system's packet bus to an exit (egress) interface such as Ethernet or another T1 line. The example path shown in Figure 1 provides a simplified picture of how VoIP calls are routed through the MAX TNT.

MultiVoice features in MAX TNT TAOS 8.0-103
MultiVoice operations

Figure 1. Simplified view of VoIP call routing within the MAX TNT



For details about VoIP call routing and how to fine tune it, see the *MultiVoice for the MAX TNT Configuration Guide* at <http://www.ascend.com/doclibrary>.

Overview of VoIP in an H.323v2 environment

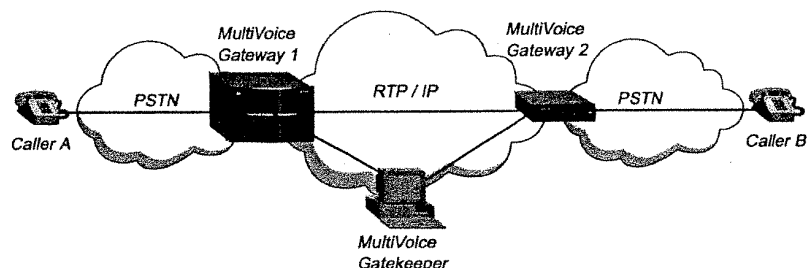
MultiVoice is compliant with the ITU-T H.323 standard for the transmission of real-time voice communications across IP networks. H.323 systems use the IETF standard Real-Time Transport Protocol (RTP) with codecs for voice and other communications over the Internet.

VoIP-enabled MAX TNT units operate as MultiVoice Gateways. Callers dial into a local MAX TNT through the PSTN. The MAX TNT then communicates with a MultiVoice Gatekeeper to establish communication channels to a far end MultiVoice Gateway. Workstations running MVAM software operate as H.323 MultiVoice Gatekeepers, which handle all call control functions, including bandwidth control, authentication, call-detail recording (CDR), and alias translation.

In the example Gateway and Gatekeeper configuration in Figure 2, two Gateways connect Caller A to Caller B. A system running MVAM performs the H.323 Gatekeeper functions.

MultiVoice features in MAX TNT TAOS 8.0-103
MultiVoice operations

Figure 2. Example diagram of MultiVoice in H.323 environment



When Caller A dials Caller B, events such as the following occur:

- 1 Caller A dials Gateway 1, and enters his or her PIN authentication (if required) and Caller B's telephone number.
- 2 Gateway 1 establishes a session with the Gatekeeper, and then forwards the telephone number and PIN authentication to the Gatekeeper.
- 3 The Gatekeeper authenticates Caller A and, if authentication is successful, forwards the IP address of Gateway 2 to Gateway 1.
- 4 Gateway 1 establishes a session with Gateway 2.
- 5 Gateway 2 forwards the call request to Caller B.
- 6 When Caller B answers the telephone (goes off-hook), voice traffic is tunneled in IP packets by means of RTP, between Gateway 1 and Gateway 2.

Overview of VoIP in an SS7 IPDC 0.12 environment

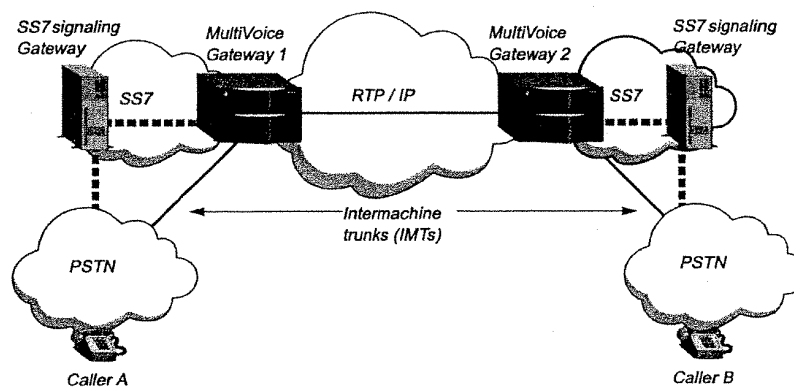
In an SS7 environment, VoIP-enabled MAX TNT units are MultiVoice Gateways that communicate with an SS7 signaling gateway to establish communication channels to a far-end MultiVoice Gateway.

The SS7 signaling gateways initiate and manage call setup and release, and execute call routing. The signaling gateway communicates call setup information to the MAX TNT using IPDC 0.12. IPDC message tags define voice encoding type, packet loading, IP and RTP ports, and other variables used for processing VoIP calls.

In the example MultiVoice Gateway and signaling gateway configuration in Figure 3, the Gateways support VoIP calls controlled by IPDC over intermachine trunks (IMTs) for SS7 calls originating from the PSTN.

MultiVoice features in MAX TNT TAOS 8.0-103
MultiVoice operations

Figure 3. Example diagram of MultiVoice in SS7 environment



When Caller A dials Caller B, the following events occur:

- 1 Caller A dials the number for their SS7 service provider plus Caller B's telephone number. For example, Caller A dials a number such as 10-10-999-1-888-555-1212.
- 2 The signaling gateway assembles call routing information, and other information required to connect the call, such as user authentication and call reporting information.
- 3 The signaling gateway then sends an SS7 message to the PSTN to ring Caller B's telephone.
- 4 The signaling gateway uses IPDC to initiate an RTP/IP connection across the packet network between Gateway 1 and Gateway 2. The signaling gateway simultaneously sends IPDC setup information to both Gateway 1 and Gateway 2.
- 5 When Caller B answers the telephone (goes off-hook), the signaling gateway converts the SS7 signals into IPDC packets, and voice traffic is tunneled in IP packets between Gateway 1 and Gateway 2 by means of RTP.
- 6 Gateway 2 passes the IPDC packets to the signaling gateway at the far end, which converts the IPDC packets to SS7 messages and routes the call across the appropriate signaling links to Caller B.

In an SS7 environment, values in IPDC message tags override corresponding call management settings in the default VoIP profile.

General system configuration for VoIP support

Lucent recommends certain IP and call-handling configurations for processing VoIP calls. Global settings that are required for VoIP communication are also described in this section.

Note: For details about recommended IP settings and routes, see the *MultiVoice for the MAX TNT Configuration Guide* at <http://www.ascend.com/doclibrary>.

Disabling ICMP Destination Unreachable packets for VoIP calls

For Voice over IP (VoIP) calls, UDP for-me packets can arrive at a rate of 200 packets per second for each direction of each call. If the MAX TNT is not listening on a port for the for-me packets while setting up or tearing down a call, it returns ICMP Destination Unreachable